Title

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Publication Date

2023-03-01

DOI

10.1016/j.jchf.2023.02.018

Peer reviewed

JACC: HEART FAILURE
PUBLISHED BY ELSEVIER ON BEHALF OF THE AMERICAN
COLLEGE OF CARDIOLOGY FOUNDATION

VOL. ■, NO. ■, 2023

LEADING EDGE COMMENTARY

Opportunities for Change in Home Health Care in Heart Failure*

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Heart failure (HF) affects an estimated 6.7 million Americans and is one of the leading causes of hospitalizations. Patients with HF are often hospitalized repeatedly over the course of their disease. This revolving door of admission and readmission is associated with increasing morbidity and poor quality of life for patients, pushing us to reconsider how to care for these patients more effectively. Home health care (HHC) programs can theoretically increase the touchpoints between HF patients and various providers (eg, physicians, nurses, pharmacists), identifying patients who might be approaching HF exacerbation and proactively adjusting their care to prevent hospitalization. In trials, these types of home-based care interventions have been associated with lower hospitalization rates and mortality for patients with HF, although these results are inconsistent, partly because of the heterogeneity in interventions and patient populations.[1] There are opportunities for broadening the scope and impact of HHC to improve HF outcomes, such as using principles from home-based primary care (HBPC), leveraging telehealth and telemonitoring technologies, and strengthening multidisciplinary collaborations.

HHC, by way of physician home calls, dates to the early 20th century. During this time, physician house calls represented about 40% of patient encounters.[2] According to an analysis of Medicare claims data, the 3 most common indications for home calls in 1993 were hypertension and its complications (11.5%), HF (7.5%), and coronary atherosclerosis (6.3%).[2] By the end of the century, however, physician home calls dramatically decreased and were replaced by hospital-based practices. Noting the value of care at home, home health nursing rose in prevalence. Policymakers pushed to fund these services through the federal government by way of Medicare, Medicaid, and Social Security. Over the decades, HHC evolved to include a multidisciplinary team of physicians, nurses, physical and occupation therapists, and home health aides to provide a wide range of services at home. As we know it today, HHC provides short-term and focused skilled services with the goal of facilitating a safe transition home after hospitalization.

Between 2002 and 2012, HHC referrals after hospitalization in the United States increased by 65% to 3.7 million, and patients with a primary diagnosis of HF were the most likely to be referred for HHC at discharge in 2012.[1] The rising trend of HHC for HF continues to persist. Using GWTG (Get With the Guidelines) HF data and Medicare claims data from 2005 to 2012, Sterling et al[3] found that 34.2% of patients admitted for HF received HHC after discharge and that the rate of HHC increased from 31.4% to 36.1% ($P < 0.001$) over the 10-year period.

The increase in HHC for HF is multifactorial and likely a direct effect of initiatives to reduce hospital length of stay and lower HF-related readmissions and associated financial penalties by Medicare. Driven by the barriers to timely access to health care, the

*Editorials published in *JACC: Heart Failure* reflect the views of the authors and do not necessarily represent the views of *JACC: Heart Failure* or the American College of Cardiology.

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The authors attest they are in compliance with human studies committees and animal welfare regulations of the authors' institutions and Food and Drug Administration guidelines, including patient consent where appropriate. For more information, visit the Author Center.

ISSN 2213-1779/$36.00 https://doi.org/10.1016/j.jchf.2023.02.018

burden of increasing health care costs, and the need for frequent health care interaction for patients with complex conditions, physician home calls are gaining popularity once again. Additionally, the growth of remote monitoring technologies and consumer-facing devices such as mobile health applications have sought to broaden the scope of HHC. The COVID-19 pandemic kickstarted efforts to keep HF patients safe at home and has inspired new strategies to improve HHC. The impact of these advancements on HF outcomes, cost, and future policy has led to exciting pragmatic implementation trials, and many others are under active investigation.

HOME-BASED CARE MODELS

In contrast to the episodic, time-limited nature of posthospitalization HHC, HBPC provides longitudinal care at home for individuals with complex and chronic medical conditions and functional limitations that interfere with engaging in clinic-based care. One of the longest-standing HBPC models is used in the VA (Veterans Affairs) Health Care System and targets veterans with multiple comorbidities or recurrent emergency department visits and hospitalizations. Care is delivered by an interdisciplinary team of physicians, nurses, social workers, psychologists, rehabilitation therapists, dieticians, and pharmacists. The VA HBPC has been shown to improve access and patient satisfaction while reducing all-cause hospitalizations and health care costs. A 2006 cost analysis of the VA HBPC demonstrated significant cost savings (approximately 16% savings to the VA and 10% savings to Medicare), primarily attributable to a reduction in acute care hospitalizations.[4] To our knowledge, there is no study that has investigated the effects of VA HBPC specifically for HF patients; however, HF is one of the most common diseases identified among veterans enrolled in HBPC.

HF patients, many of whom experience recurrent hospitalizations in their lifetime and need to manage many comorbidities and medications, are thus the ideal target for this care model. A home-based care model for HF might enable frequent touchpoints by providers who have cultivated a relationship with patients and may be more likely to detect subtle signals suggesting the risk of an HF decompensation (ie, pre-exacerbative conditions). Workflows must be established that effectively adjust a patient's diuretic regimen and evaluate for acute comorbid illnesses such as infections. Proactive patient engagement and communication with clinicians well versed in the management of HF can facilitate the early treatment of an HF exacerbation before severe hypervolemia or organ dysfunction and medical distress arise.

Hospital at home (HaH) is an iteration of home-based care that provides services for patients who meet criteria for hospitalization but can be safely cared for in an individual's home. Foreseeable benefits for this model of care include reduction in overall cost and less risk of adverse iatrogenic outcomes, such as delirium, hospital-associated disability, and nosocomial infections. One meta-analysis of 61 randomized controlled trials comparing HaH with in-hospital treatment found that HaH was associated with reduced mortality, readmission rates, and cost as well as higher patient and carer satisfaction.[5]

HBPC, by definition, provides a wide range of primary care services, care coordination, and preventive care; however, specialty care remains the missing link. After an HF hospitalization, HHC is usually limited to posthospitalization home visits by nurses and pharmacists focused on optimizing medication management and identifying clinical deterioration during the vulnerable postdischarge period. Home-based cardiac rehabilitation, via remote coaching with indirect exercise supervision, is an effective alternative to center-based cardiac rehabilitation, but most U.S. health care organizations have little to no experience with such programs. Innovations in HF-specific home-based care could be an evolving care model for HF patients who experience recurrent HF exacerbations and require closer monitoring.

One goal of subspecialty home-based care is enhanced supervised self-management through engagement with caregivers such as family members or home care workers (HCWs). HCWs, such as health aids and personal care attendants, are in a unique position to assist patients with daily activities such as preparing low-salt meals, monitoring weight and blood pressures, and assisting with doctors' appointments. HCWs typically do not receive specialized training to care for patients with HF and, as a result, might advise patients to go the Emergency Department when the patient could be managed at home. There is an opportunity to train HCWs with specialty-focused, practical, and standardized training in HF to avoid unnecessary hospitalizations. The next section discusses how telehealth technologies and structured programs can be leveraged to

facilitate communication and engagement among patients, caregivers, and medical teams to enhance HHC in HF.

LEVERAGING TELEMONITORING TECHNOLOGIES

Telehealth programs and technologies are already in use for the care of patients with HF and can complement HHC services. HF assessment and management over telehealth visits include evaluation of clinical status, medication review and management, screening for adverse events, optimization of guideline-directed therapy, and patient counseling. Virtual visits have the added benefit of engaging patients in their home environment. Medication reconciliation might be more effective during virtual visits as compared to in-person visits, where patients frequently forget to bring their medications.

Home telemonitoring (HT) can provide clinicians remote access to patient data, such as blood pressure, weight, and oxygen saturation. The rising use of mobile devices with heart rate and rhythm monitoring represents additional data points that can be directly transmitted to patients' care teams, and many are being studied in randomized trials. Cardiovascular implantable electronic devices, such as permanent pacemakers and cardioverter-defibrillators, can continuously monitor physiologic parameters such as transthoracic impedance and automatically send the information to clinicians, thus alerting clinicians of changes in a patient's clinical status. Implantable wireless pulmonary artery pressure monitors have been tailored to identify early clinical congestion and worsening disease as well as track hemodynamic measures for patients longitudinally over time. These technologies can empower patients to track and self-manage their HF, and the data obtained can help us understand the clinical course of HF.

In addition to patient-facing technologies, digital health innovations can be used to facilitate the care provided by HCWs for HF patients. Despite digitalization of health care and the electronic medical record, the mechanisms for recording data and communication between HCWs and the clinical teams are outdated (pen and paper) and informal (no mechanism for documentation and communication).[6] Possible technological solutions include creating an online platform for HCWs to document clinical observations in real time with an opportunity for feedback and a portal of online resources for HCWs to access disease-specific information.

To summarize, the combination of HT and HHC can have multitier benefits. It can facilitate awareness and confidence in the self-management of HF, improve adherence to lifestyle changes, and mitigate social isolation for patients. For clinicians, the inflow and interaction with patient data can support optimization of medical therapies, treatment of comorbid conditions, and opportunities for patient education. The promise of HT goes beyond the individual level to the larger goal of improved systems of delivery—to enable clinicians to steadily monitor patients' clinical status and proactively intervene before patients become severely ill and require hospitalization.

REVIEW OF TELEHEALTH TECHNOLOGIES FOR HHC

A 2015 Cochrane review consisting of 41 studies of telemonitoring interventions for patients with HF found improved all-cause mortality and HF-related hospitalizations when compared with usual care, highlighting opportunities in leveraging HT for enhanced HHC.[7] However, other studies investigating HT have not borne this out. The types of HT interventions and study methods (eg, duration and timing of intervention) of the trials have varied widely, and it is not clear which practices are most effective. In addition, many facilities have already adopted some form of telehealth support, so "standard care" as studied in prior trials may no longer exist, and the incremental benefit of new HT interventions is uncertain. It is also unclear which patient population—based on HF severity or comorbidities, for instance—might benefit the most. Furthermore, varying and relatively low rates of HT adherence make it challenging to study. Putting it together, in what ways might HT complement, and not hinder, HHC in caring for patients with HF?

Tele-HF (Telemonitoring to Improve HF Outcomes), published in 2010, was one of the earliest and largest randomized controlled trials in the United States investigating basic telemonitoring tools for HF. The study recruited 1,653 participants with a recent HF hospitalization and compared an automated telephone-based symptom and weight monitoring program with usual care. Tele-HF found no significant benefit in the telehealth intervention group over usual care in terms of all-cause rehospitalization rates or death at 6 months.[8] However, the study's authors noted that 14% of patients who were assigned to the telemonitoring group never used the system and that by the final week of the study period, only 55% of the patients were using the system at least 3 times per

week.[8] A few years later, BEAT-HF (Better Effectiveness After Transition–HF) found comparable rates of telemonitoring adherence.[9]

Taking a systems approach, TIM-HF2 (Telemedical Interventional Management in HF II) asked if a holistic, structured remote patient management intervention in a telemedical center with readily available physicians and HF nurses could improve HF outcomes.[10] TIM-HF2 attempted to define the patient population in which an HT approach could prove to be beneficial. By subgroup analysis, the study suggested that patients with HF in New York Heart Association functional classes II and III within 1 year of a decompensated HF hospitalization and who did not have major depression might benefit the most from telehealth services.[10] These select prospective randomized trials highlight the need to refine this model of care and its optimal patient population to ensure the adherence to and effectiveness of telehealth-based home care.

EFFECTS OF COVID-19

Early in the COVID-19 pandemic, HHC agencies were affected by similar challenges as acute health care settings, including staffing shortages, lack of sufficient personal protective equipment, and inadequate training in infection control. Some states did not designate HCWs as "essential," leading to increasing difficulty in obtaining personal protective equipment and COVID-19 testing, accessing clients living in residential facilities, and obtaining the COVID-19 vaccine.[11] The goals around infection control and keeping patients out of the hospital, especially those who were at high risk and with multiple comorbidities, aligned with the intentions of HHC. Subsequently, increased Medicaid payments and federal funding led to enhanced support for home care agencies. Under the 2020 CARES (Coronavirus Aid, Relief, and Economic Security) Act, nonphysician providers, such as nurse practitioners and physician assistants, were permitted to order home health services, contributing to an uptake of HHC clients and making up for the initial loss of clients that arose from cancellations of elective surgeries and fear of COVID-19 spread early on.[11]

Under the 2020 COVID-19 public health emergency (PHE) measures, policy changes around medical licensing, privacy, and reimbursement rapidly increased telehealth and virtual care. Although patients and clinicians may not have been as comfortable with virtual visits previously, the COVID-19 pandemic made them mainstream. In doing so, the pandemic highlighted the need for high-quality broadband services, telehealth technology, and digital literacy to provide equitable and high-quality virtual, home-based care. Specifically, the CARES Act encouraged the use of telehealth by home health agencies. Although many agencies took advantage of the increased opportunities for telehealth, advocates and home care agencies commented that they were unable to be reimbursed for these telehealth services through Medicare. As the COVID-19 PHE is set to end in 2023, some of the associated policy changes around home-based care have been made permanent or extended, highlighting the perceived impact that HHC will play in the future of health care. The impact of the end of the PHE on HHC policy is unclear.

CONCLUSIONS

Given the increasingly large burden of HF and high acute care costs, there is a need to explore innovative ways to improve the treatment of chronic HF, such as home-based care with supervised self-management. Investing in research and innovation tailored to address HF care in the patient's home should be a high priority for the U.S. health care system.

FUNDING SUPPORT AND AUTHOR DISCLOSURES

The authors have reported that they have no relationships relevant to the contents of this paper to disclose.

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KEY WORDS heart failure, home-based primary care, home health, telehealth